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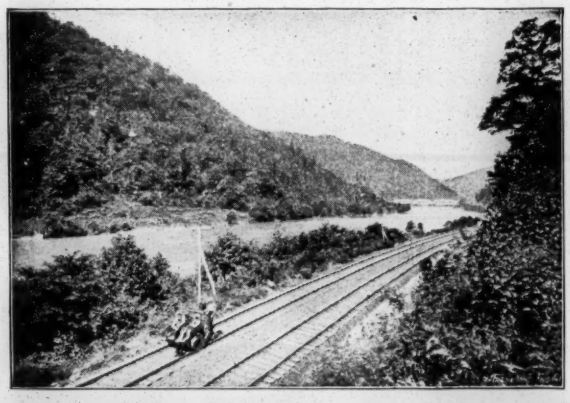

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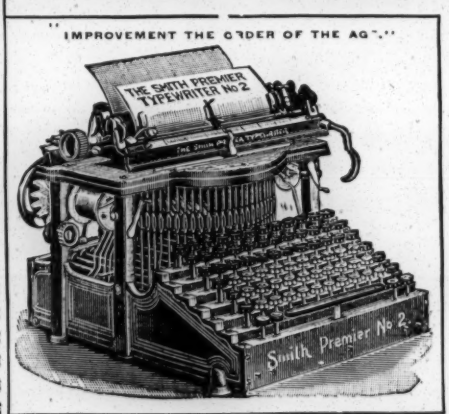

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SUMATRA'S WEST COAST

By DAVID G. FAIRCHILD,
United States Department of Agriculture

The island of Sumatra is undoubtedly one of the most valuable of all the Dutch possessions in the East. Its resources are almost wholly undeveloped and its interior is scarcely even known, only one or two expeditions ever having crossed the island in its widest part. It contains a great variety of mineral and vegetable products, and its trackless forests are filled with still unconquered tribes of men—remarkable cannibals among them—numerous rhinoceroses, and large herds of elephants. It possesses a chain of verdure-clad volcanoes which give to its west coast one of the most salubrious climates in the archipelago, and its scenery surpasses in beauty the famous scenery of Java, which has been called the most beautiful tropical island in the world. The island is held by a small force of Dutch and native soldiers and governed by a body of Dutch officials scattered along the coast cities, whose control over the natives is more moral than physical.

That such a marvelous island should have remained so long comparatively unexplored simply illustrates the slowness with which the work of exploration is being conducted by the Dutch home government, which hampers in every way the movements of the more progressive colonial government. As American interests in the East are increasing, the readers of this magazine may find acceptable a few notes regarding one of the largest and certainly the most beautiful island of the whole archipelago. Miss Scidmore has called Java the Garden of the East in her

charming account of travel among its miniature bamboo villages and paddy fields. Sumatra is compared by the Dutch, although incomparably grander and totally different, to Switzerland. You approach Java with a feeling of how beautiful and lovable everything seems, but as you steam into Emma harbor, on Sumatra's west coast, your mind is overpowered by the sight of the verdure-covered volcanoes and trackless forests stretching away into the unknown and undiscovered.

ON THE WEST COAST OF SUMATRA — EARLY MORNING

The western coast of this wonderful island, famed among the Dutch as *Het Boven Land van Sumatra*, is as near a tropical Switzerland (if such an appellation does not convey a confused notion) as is to be found anywhere on the globe. New Zealand can boast of glaciers of surpassing beauty, justly entitling it to the place it holds as the Switzerland of the southern hemisphere, but I am confident that after the sources of the Amazon have been thrown open to the tourist and Orizaba has been surrounded by winter hotels, the most luxuriant vegetation and most wildly fascinating scenery in the world will be sought for among the chain of volcanoes that forms the backbone of Sumatra.

There are several ways of visiting Sumatra, none being very direct, but the pleasantest is to take one of the comfortable steamers of the *Koninklijke Paketvaart-Maatschappij*, either from the island of Penang, where tourists call going either way around the world, and steam west to the north point of the island and southward along its western coast to Padang, the principal port, or do as my friend Mr Barbour Lathrop and I did, leaving Batavia on the north coast of Java and steaming west through the straits of Sunda past the famous volcano of Krakatua and northward along the coast, stopping at Padang over one steamer and catching the next, which landed us finally at Penang. The city of Padang seemed on the first night of arrival one of the hottest and wettest places it were possible for water and sunshine to concoct; but where the sunlight pours down its rays perpendicularly and the clouds every afternoon empty an almost unlimited quantity of water, palms are able to live a life really becoming such royal representatives of the vegetable kingdom. You feel oppressed with the inconceivable power of the living matter, the protoplasm, which surrounds you. In temperate regions you have become accustomed to the supremacy of man. He cuts down and destroys and clears big patches of ground free almost of every living thing. Here you feel as if the plants merely tolerated your presence.

The hotels serve to distract your attention from nobler thoughts by their insufficiencies and limited capacity. I have often wondered what a party of Cook's tourists would do if they landed and found only four or five beds at the disposition of new arrivals and not sufficient bananas to go around. To be met at your first meal in the tropics when you look forward to reveling in the delicious new sorts of bananas with the incomprehensible statement of "*tida ada lagi*," which, being interpreted by your Dutch acquaintance, means "There are no more," is a hard and unforgetable experience, the more inexplicable since the level plains about the town are filled with immense banana plantations. One small banana is not enough for an appetite whetted by a long ocean voyage. This is, however, an introduction to one of the many peculiarities of the tropics which irritate you until you find the absurdity of being irritated by the unavoidable.

Padang as a town has nothing to recommend it. Its public buildings and houses are embowered in the most gorgeous tropical vegetation, but they themselves are plain, and look as if they were moth-eaten. Termites work rapidly upon the corner

COURT-HOUSE NEAR PADANG PANDJANG, SUMATRA

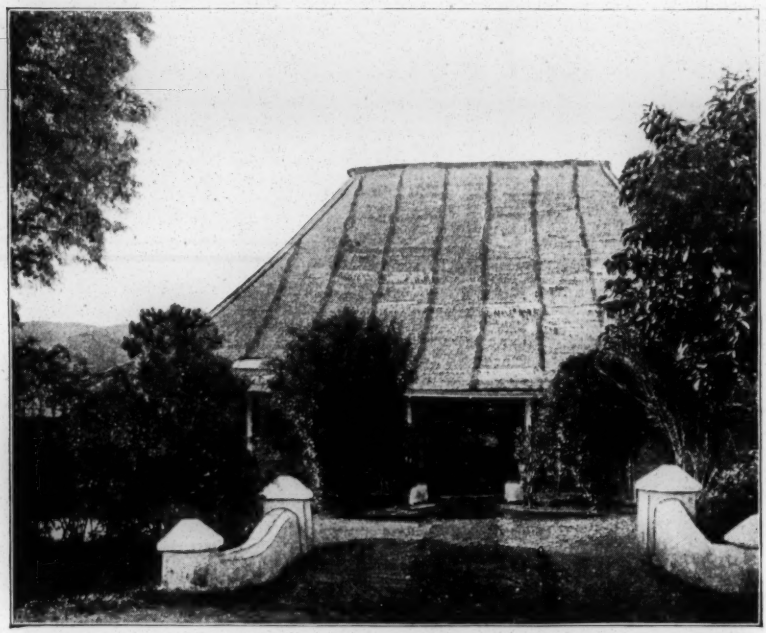
posts, and decay soon makes new buildings old. Then, too, the malarial plasmodium finds in the region a most congenial home, and the pallid faces and slow gate of the Europeans tell too plainly of an unequal struggle between blood corpuscles and the invading army of parasites. I do not know that Padang is celebrated for its fevers, though it is certainly not a healthy place. But it is for other reasons that travelers do not stay long in Padang. As the terminus of a most remarkable mountain railroad, worthy of a Meiggs, one of the earliest cog railways ever constructed for freight purposes, it affords the traveler unrivaled opportunities to "get into the interior," as explorers express it. The Ombilin coal-fields send to Padang by means of this road the coal for the Netherland steamship line, which calls here both in and out bound. It is not a great way from this region that some of the petroleum fields have been discovered, which the Standard Oil Company tried in vain to get control of,

being checked, so the newspapers report, by a suspicious paternal home government, which wishes to hold everything valuable in its own hands. Stretches of low swampy jungle line the track on both sides. Thickets of the Atap palm, with its creeping stem and rigid upright leaves, whose leaflets flutter incessantly in the slightest breeze, rise out of deep weed-overgrown pools, suggestive of all sorts of serpents, leeches, and water insects. Immense plantations of bananas, overgrown with masses of tangled morning glories, with their light-blue blossoms, have crowded out the more varied natural vegetation in places and stand as evidences of the cultural skill and indomitable energy of those greatest of all tropical colonizers, the Chinese.

But soon the train whirled us into the klof or gorge itself, and for several hours our eyes were busy with scenes of the most gorgeous freshness and beauty. The charm of tropical verdure is largely due, I believe, to the abundance of broad-leaved plants which it contains. Nothing illustrates this more than a comparison of such plants as the banana or talipot palm with a South African fine-leaved heath or a North woods pine. As individuals all are beautiful, perhaps equally so; but the water-colors of the tropics are painted in splashes and with a broad, free hand, while the foliage of the temperate regions is painfully etched on copper plate. This gorge is compared by the Dutch with the Gotthard Strasse below Andermatt; but they belittle it by such comparison, for the Klof van Aneh, with its countless waterfalls, rushing mountain streams, cloud-covered hillsides, and floating mists, added to its endless variety of flowering shrubs, feathery fern fronds, waving palms, and tall, imposing forest trees, makes a composition of the first rank among scenic masterpieces and entitles it to the first place on the line of the world's gallery.

Padang Pandjang, a village some 700 meters above the sea-level, with a comfortable hotel of brick and thatch, after the Dutch style, forms a most delightful stopping place just above the gorge. The natives here, although of the Malay race, are quite distinct from those of the island of Java or the peninsula of Malacca. They are a well-to-do, even wealthy race, and build costly houses of indisputable beauty, making them of teak or other wood, paneling them with great care, carving and painting them after patterns often of considerable taste and beauty. The roof structures, with their gables rising one above the other, resemble more those of the Siamese temples than any other

Oriental structures. The floors of nearly all sag in the middle and the ends of the houses are raised on high posts, frequently carved and sometimes filled with bamboo wickerwork. They are often communal in nature, as many as three or four families living in the same dwelling. In front of each dwelling-house stands a small square building, more highly decorated often than the house itself, which is used for a *goedang* or rice granary, and no native compound of houses is complete without such a *goedang*. The interiors of these houses are not without modern



HOTEL AT PADANG PANDJANG, SUMATRA

conveniences in the way of comfortable beds, with pillows and canopies, the better of the latter being often decorated with curious and showy pendent ornaments made entirely of the white pith of some tropical plant. These houses are more comfortable than those of any other race in the Dutch East Indies, and seem luxurious when compared with the dirty hovels of the Maoris or the pebble-floored homes of the Samoans.

Although my friend and I were prepared by the enthusiastic accounts of the Dutch officials to see a more comely race than the Javanese in Sumatra, we were surprised and charmed by the

picturesque and highly colored costumes of the natives. Nowhere did we see these costumes so abundant or striking as at a little market or *passer* half way to the larger market of *Koeboe Krambil*, to which we drove behind a crazy pair of ponies in a very uncomfortable "herdic." There in a little clearing in the dense vegetation about one of the prettiest of native public houses, where public declarations are made and cock-fights witnessed, was gathered the most effectively gaudy and picturesque group of natives I had ever seen. Immense Roman and Egyptian-like head-dresses, carefully colored sarongs tightly but gracefully folded about the shapely forms, jackets of soft, loosely woven black, trimmed with gold and silver braid, and bracelets and bangles in great profusion, reminded one of a gala day in some Italian or Spanish town. But the most curious feature of the native dress is their earrings, or ear-buttons, as they would be more properly called, for they are sometimes an inch or more in diameter and of light but solid metal. All stages in the preparation of the ear for the reception of these buttons were to be found. There were mere babies with a single small puncture,

SUMATRAN DWELLING-HOUSE, SHOWING BAMBOO WICKERWORK AND ELABORATE CARVING AND PANELING

sweet-faced children of four with a coiled bit of springy banana leaf rolled tightly and passed through the puncture to continually expand it to the proper diameter by the pressure of the unrolling leaf, and graceful young belles with gold and silver buttons tastefully elaborated as large as the top of an after-dinner coffee cup. The young girls, we were told, could wear their earrings or not as they chose, but if they knew how ugly they looked when the buttons are removed and the lobe of the ear appears as a loop of gristle which dangles and flaps against the cheek, they would wear them always. Upon marriage, however, the bride must wear the buttons, as with us the wedding ring. After the birth of the first child, or when five years have elapsed, she must take them out and lay them aside. The old women are generally ugly, as they have buttonless ears, though as far as their other features go they are remarkably well preserved. Then, too, there is more significance in the dress of these natives than there is in that of the Javanese. If a woman is poor she wears a single dark skirt or sarong; if she is well-to-do she puts a second more costly over it, covering all but the bottom; if she is rich she puts on a third, covering the major part of the second, and if she is very rich she dons a fourth. The strange carved and gilded light wooden head-dresses and still stranger box-like bracelets, as well as the delicately formed bangles and diamond-set pins and bracelets, one of which we priced and found to be worth $150, testify to a skill as gold-workers which rivals that of the natives of British India. The golden sarongs, for which the women ask $50 or more apiece, are too somber and in this regard are disappointing, lacking that originality of pattern we are used to attribute to the Orient. The silver filigree work of the men, were you not on the other side of the world, you would swear was made in Mexico, it so nearly resembles it in fineness of detail and originality of design. Their beaten ware and heavier pieces are distinctly inferior to the British Indian work.

The surroundings of Padang Pandjang rival the famous scenes from the little Javanese town of Buitenzorg, accounted one of the three or four most beautiful spots in the world. The sunsets over the volcanoes Singgalang and Merapi, with their low-drifting clouds of peculiar violet, purple, and lilac hues, form sights never to be forgotten. The famous sunsets in the Indian ocean are no more wonderful. Pathways lead off from the well-traveled road at every turn, and you have only to follow one of these

SUMATRAN BRIDE AND GROOM

From a photograph by David G. Fairchild

for a few minutes to find yourself in the midst of the most luxuriant forest, with overtowering bamboos and treeferns, palms and flowering shrubs, thickets of impenetrable rattan palms, low bushes over which immense numbers of large black ants are running, moist moss-covered banks, a tangled mass of liverworts, filmy ferns, and lichens, with here and there an insect so closely resembling the bits of lichen that even an expert entomologist might pass it by unnoticed. Close by the path, in one of the most fascinating of these many valleys, there was growing a clump of

bamboo, some of the shoots of which, although eighty feet or more in height, were evidently newly grown, with leaves still immature. I shook one of these young shoots lightly with my hands, and, to my surprise, the whole top, fifteen feet or more in length, snapped off, and, falling at my feet, was broken into a half dozen fragments. Few experiences could give one a better idea of the rapid growth of plants in the tropics than this—growing like a giant asparagus shoot at the rate of a foot or more a day, in a short three months it is a tree of the forest towering above the tops of many century-old monarchs, and yet, after all, it is botanically nothing but a grass.

Though acquainted with the luxuriance of vegetation for which Java is justly celebrated, I was little prepared for the overwhelming exuberance of growth around Padang Pandjang, and when the time came for us to leave I was almost ready to abandon the enticing trip already promised me by my friend in favor of a little longer sojourn amid its beauties.

Fort de Kock, our next stopping-place—940 meters above the sea—is known all over the Dutch East Indies as a sanitarium

ROW OF SUMATRAN HOUSES NEAR FORT DE KOCK, SHOWING CURIOUS GABLES

for the Dutch army. Officers and men are sent there from other portions of the archipelago to recover from the malarial fever or the berri-berri, the two most prevalent and dangerous diseases of this portion of the world. The cool, dry mountain air soon fits them for active service again. The town itself has little of interest. The hotel, filled as it is with convalescent soldiers and their faithful wives, is poor enough, being kept by half-castes with more kindliness than business ability. The surrounding country is open prairie, dotted with clumps of bamboo and bits of thick woodland, and makes a very different impression from the scenery about Padang Pandjang. The native villages, surrounded by fruit trees and patches of upland rice, contain a well-to-do race of people, some of whom manufacture jewelry, expensive gold-woven cloths, and beaten silverware, Kota Gedong being the center for this kind of work. It was interesting to notice the independence of the native women, which in fact is one of their marked characteristics, either an outgrowth or consequence of their marriage customs. A man and woman upon marrying do not form a home of their own, but the husband remains among his own circle of relations and resides only temporarily with his wife. The children remain with her and inherit all her property and a half of that earned by their father and mother together. The remaining half goes to their father's sisters or to the children of those sisters.

From Fort de Kock to the little village of Pajo Kombo, the end of this branch of the railroad, is only a few miles. It is the farthest inland town that can be reached by rail, and its principal street, a broad, straight avenue of casuarinas, is lined on either side with innumerable small villages and curious messigits or Mohammedan temples. Near the center of this avenue is a large open square or market-place, in which on "Passar" or market days the natives gather with their curious wares. It is on such market days that the Pajo Kombo women, noted all over the Dutch East Indies for their beauty, are to be seen arrayed in their costly sarongs and decked out with their bangles, ear-buttons, and bracelets. Whether or not we really saw a special market or *Passar besar* I do not know, but there were thousands of people there whose costumes to our eyes did not compare favorably with those worn at the modest little passar near Padang Pandjang. Few sights can surpass a Malay passar, however, in interest. There is a wonderful array of strange fruit and vegetables, devices for striking fire, children's toys, ornaments for

SUMATRAN MESSIGIT OR TEMPLE, NEAR PAJO KOMBO

From a photograph by David G. Fairchild

head-dresses, cooking utensils, cloths of bright but tastefully blended colors, and a whole host of light refreshments—palm wines, peanut cheeses covered with heavy growths of green and yellow molds, pineapple sauces, inviting-looking curries, and cooling drinks innumerable. The live-stock market near by showed that the resources of the island in this direction were excellent, as cattle after the Alderney type, and hogs, tough little ponies, goats, and Indian buffalo were exhibited in profusion.

One visits Pajo Kombo because it is the nearest point to the klof or gorge of Harau and the waterfalls of Batang-Harau, called by the Dutch the Lauterbrunnen and Staubbach respectively of their Indies. It is curious to note how the Dutch compare scenes in Sumatra with noted points of interest in Switzerland, whereas in fact there is little comparison and absolutely no similarity, the rugged grandeur of Switzerland in no sense recalling the foliage-softened outlines of Sumatra. An hour's ride in an uncomfortable native cart brought us to the entrance of this little-known but certainly most wonderful gorge. As we

approached, the tall gray marble cliffs rose perpendicularly before us to a height of 200 or 300 meters; on either side, like silken threads, we counted fifteen waterfalls tumbling down from the table land above. The niches and crevices of this gray marble formed footholds for the most varied of tropical plants, and these in their growth covered great patches with luxuriant verdure or brilliant coloring. Bathed in spray from the waterfalls, there were countless tropical ferns and lichens, algæ, liverworts, and mosses. Through the gorge, at places not more than 70 feet wide, flowed a stream of clear water, its banks and bed clothed with insectivorous water plants and overhung with flowering shrubs and rank growing grasses and sedges. The fall of Batang-Harau suggests by its height and volume the Staubbach near Lauterbrunnen, but at its foot is a mass of moss and fern-covered boulders instead of the barren shale, worn by tourists' feet. Instead of the flower-covered carpet of the Alps the narrow valley was filled with palms, rank grasses, small rubber trees, and a host of strange shrubs and flowering plants, among them curious melastomas and a large orange-fruited fig which decorated the

SUMATRAN MESSIGIT OR TEMPLE, WITH PRIEST IN FOREGROUND—PAJO KOMBO

cliffs with its fruit and foliage. No orchids were to be seen anywhere in the gorge, and it is possible that they had been taken out by some orchid-hunter.

After a morning spent in exploring the resources of this wonderful gorge, we returned to the comfortable little hotel at Paja Kombo, where that most remarkable of rice lunches, the *rijs tafel*, was being prepared for us. The next morning we returned by rail to Padang Pandjang and passed again through the Klof van Aneh, where drifting clouds and occasional showers served to heighten the glory of its scenery.

The comfortable steamer *Maetsuijcker* of the Royal Packet Company, the great steamship monopoly of the archipelago, was at anchor the next day at Emma harbor when we arrived by train from Padang. Over five hundred soldiers were ticketed to leave by her, and the wharf was swarming with the soldiers and their wives. It was not either, as might be expected, a scene of leave-taking, for in the Dutch Indian army the soldiers take their wives with them into the field—that is, a certain number of them chosen by lot for each company—native wives, be it understood. Decks were strewn with blankets and camp utensils and every available inch of space was occupied. They were all bound for Atjeh, the northern point of the island, where for the last 25 years the Dutch have been trying to conquer one of the most warlike and stubborn races of savages in all the Orient. For several months past the Dutch troops had been unusually active in Atjeh, or Achin, as it is called in English, and this accounted for the large body of troops going north at this time. Little or nothing regarding these movements of the Dutch troops against the Achinese gets into our press, but nevertheless they are of a serious nature and entail yearly the sacrifice of many lives and the expenditure of large sums of money. That their campaigns are not prosecuted with that vigor which would seem to an American necessary and economical can scarcely be questioned, but certainly the difficulties of climate and position are great and the bravery and persistence of the Dutch troops, who sooner or later fall victims to the dreaded malaria, are of the most praiseworthy character.

The journey by sea up the west coast of Sumatra, unless it be made on one of the small coasting steamers, is generally uneventful. The low-lying islands of Nias and Poelo Tello, however interesting to a naturalist or ethnologist, are only low-lying islands of little interest as seen from the vessel. Two whole

days steaming brought us to anchor in the roadstead of Oleh-leh, the port of the old capital of Achin, the fortified town of Kota Radja.

Under the kind escort of the captain we landed that Christmas morning and drove from the port a distance of several miles to Kota Radja. The city, which contains some 20,000 inhabitants, is surrounded by a ten-foot iron picket fence, through which access is gained at carefully guarded gateways. Inside the town lies the walled fort, where the officers' quarters are found, and which is also guarded, so that in case of a general attack it may form a place of retreat. A string of some fourteen forts and blockhouses has been thrown—horseshoe-like with either end on the coast—about the town of Kota Radja and are all connected by a narrow-gauge railroad with each other and with Kota Radja itself. The coaches are provided with iron plating and serve for the transport of supplies, of troops, and seemingly of school children as well, for, as we made our visit to the blockhouses along the line, some bright-looking girls scrambled in, books in hand, bound for the day school in Kota Radja, and they seemed quite as unconcerned as if no war was in progress and heedless of the fact that from the jungle in the near distance might at any time issue a hail of bullets.

These forts and blockhouses contain from 150 to 700 men each and several Maxim guns. They are made of piles 10 or more feet high, driven closely together, and are protected by a mass of wire stretched over low iron posts, barbed-wire fences, and a broad border of century plants arranged in closely planted rows; in fact, everything uncomfortable to bare feet is thrown about these stockades. For a half mile or more about this line of blockhouses the forest is entirely cleared away, leaving a clean sweep for the Maxim guns, while inside the line of railway the friendly natives are allowed to plant their rice. They are prevented, however, from harvesting it until they shall have spied out and delivered to the Dutch for punishment a certain number of their warlike neighbors.

It would be hard to imagine a more uninteresting life than that led by the officers and soldiers who garrison these blockhouses. Narrow, low houses, with a single thickness of corrugated iron to keep out the heat of that burning tropical sun, few trees or often none to shed a grateful shade, and no intercourse with the outside world save through the occasional newspaper or magazine—no seasons, no change from the daily routine of

the tropics—it is no wonder that cases of insomnia are frequent and insanity one of the most dreaded of results. There are no more touching instances to be found of self-sacrifice than those of the wives of Dutch officers in Achin, who prefer short lives with their husbands under such uncomfortable conditions to long lives at home in snug little Holland.

On our return to Kota Radja we were shown through the truly wonderful army hospital, where patients both civil and military are cared for, and where, between April 24 and December 24 of 1896, 1,265 cases of wounded men and several thousand civilians and soldiers, for diseases other than those arising from wounds, were treated. The minor cases were treated in the hospitals of the various forts, and when we take into consideration the heavy per cent of deaths we get an idea of the serious nature of the fighting. One corner was occupied by the cholera huts—temporary structures which are burned after each patient is treated and buried—for, according to the commanding surgeon's statement, no real cases of Asiatic cholera have, in his experience, yielded to treatment. Achinese, Dutch, or Malay soldiers are faithfully treated, and though the Achinese, as soon as well and free, sometimes escape and return to their people to fight against the Dutch, when picked up as wounded prisoners they receive as careful treatment as though they were loyal subjects.

Leaving Oleh-leh late that night after a charming experience of Dutch hospitality, we anchored next morning off Segli, considered the most dangerous benteng or fort in Sumatra. Later in the day we landed at Telok Semawe, a fort further down the coast, protected by a most formidable series of high barbed-wire fences and agave. There was an air about these blockhouses or bentengs reminding one forcibly of the Indian blockhouses of our forefathers, and should we see fit to undertake the control of such an archipelago as the Philippines, the training of our regulars as Indian fighters would come into excellent play, though the races there are perhaps not comparably as stubborn as these long, lithe muscular Achinese.

The trip from Telok Semawe to Penang was uneventful, and both my friend and I felt that in seeing this corner of the world our eyes had been opened to a war of more importance than we had either of us dreamed of finding there, and to the beauties of an island which has probably no equal for tropical beauty and grandeur in the world.

WHAT IS THE TIDE OF THE OPEN ATLANTIC?*

By Mark S. W. Jefferson

The writer has sought to collect the known facts of the tides of Atlantic North America and study them in relation to the geography.

At the present date the mathematical theory of the tides has reached a considerable degree of perfection. The theory of geographic influences can hardly be said to have been formulated. Analysis has succeeded in predicting the tides of tomorrow from those of yesterday, but no description of shore configuration and submerged topography will yet enable the mathematician to predict the time and height of the tide at an unknown port. Give him a series of observations at that place, and he will learn from them the local constants and compute the future tides with accuracy. This is indeed the only end he has had in view, and it is of great practical importance. The results now accumulated are sufficiently accurate and numerous to deserve comparative study. Furthermore, much light is shed upon this study by the hints that analysts have dropped by the way, if a layman may venture to interpret them. But for Ferrel's "Treatise on Tides" the present paper could not have been written. Most readers would find the mathematical work veiled in mystery, and not all mathematicians condescend to draw aside the veil. Diurnal inequality, for instance, affects low water little or none and high water much. A mathematician states that harmonic analysis shows it must be so, and we may get what enlightenment from it we can.

In such a study one is immediately struck by the twofold aspect of the problem:

(1) The tides of theory reside in the deep ocean.

(2) The tides of observation belong to the margins of the land.

Data given for tides in the open ocean refer merely to the shores of oceanic islands, and it should be borne in mind that tides on the ocean do not admit of measurement by any means as yet at our command, though it is not inconceivable that a gauge might be lowered to the ocean floor which should record

* Extract from Thesis in research course in Geography at Harvard University.

fluctuations of pressure by means of an electrical communication with the surface.

All study of the tides must therefore proceed from the shores.

SUBDIVISION OF AREA

The tidal stations for our area fall naturally into two groups as regards distribution in (1) the land-locked waters of the shore itself and (2) the shallow waters bordering North America on the east. Brief notes on the tides of the first area (estuarine) have already been published in the September number of this magazine. Certain water bodies of form not unlike the estuaries there studied could not be included in that paper from the anomalous character of their tides. These are the Bay of Fundy, Vineyard sound, Buzzards bay, Narragansett bay, and Long Island sound. For these waters and the general tidal phenomena of the shallow offshore waters we get light from the consideration of the tides in the open Atlantic, and we immediately see that the older view of the ocean tides is in conflict with the facts now widely observed. This was the view of the progressive wave and the cotidal lines. Many difficulties are smoothed over by limiting this conception to the shallower shore waters and supposing the ocean basin to be the seat of a stationary wave with vibration period adjusted to the motion of the moon.

PROGRESSIVE AND STATIONARY WAVES

A pebble dropped into still water sends circling ripples in every direction from the point of plunge. The ripple is a little wave that travels off till overcome by frictional resistances or stopped by the shore. It is a progressive wave. To form it a number of water particles *in succession* move up, forward, down, and back, as may be noted by floating sticks and straws. Such a wave is produced at or off the mouths of estuaries and travels up them. The velocity is supposed to be that acquired by a body falling freely through one-half the depth of water.*

If you lift one side of a basin or tub partly filled with water and quickly lower it again, the water within oscillates as a whole in a time dependent for any one vessel on the depth of water. The water on opposite sides rises and falls, up at one side when down on the other. Along a line across the center there is no

*To make this available in rivers we need a formula for integrating the varying depth and recognition of the effect of width. Now that the Delaware has been gauged, such a study is possible.

vertical motion. It is a stationary wave with a central node. As with a pendulum, successive oscillations are in the same period, but the period may be changed by changing the depth of water. If the nodal axis lies north and south, as when the east end of the vessel has been lifted, the motion of the water particles is simultaneously to the west, then simultaneously to the east. A fall on the east corresponds to a rise on the west, the amount of rise and fall depending on distance from the node and (much more) on local configuration. Stationary waves may be studied in a tumbler of water, and the experiment should be tried.

THE EARLIER VIEW

It is usual in tidal discussions to assume a general case of convenient conditions and come later to the real problem—the tides in the case of nature. The general case supposed was a sphere uniformly covered with water. The moon was considered to have the power of heaping up the waters at the points of the earth nearest to itself and farthest away. The deepening of the waters at these two points would be accompanied by a shallowing around a circle equatorial to these points as poles. Thus the ocean would assume the shape of a prolate spheroid with longer axis always pointed at the moon. The earth would always have its two high waters at its opposite points, with low waters between. In the mean 6h. 13m.—a half lunar day—would intervene between high and low and between low and high. This spheroidal shell would seem to revolve about the earth with the moon, alternately elevating and depressing the water surface of any place. The first assumption to reject for the actual world is the earth's uniform envelope of ocean. The Atlantic is barred east and west by continents. The apices of a tidal spheroid cannot come to this water body in a daily swing about the earth. When the moon is over the eastern border of the ocean it might heap the waters there in a tide that would accompany it in its apparent westward path across the ocean; but at the American continent this action must for the moment cease. Each ocean would see the birth and death of a tidal wave at its eastern and western bounds.

Below the southern continents, in latitude 60°, is a ring of continuous ocean, with tides probably simultaneous, 180° apart.* This belt alone, then, conforms to ideal conditions. It is hard to

*South Georgia and Aukland island, near this circle, are distant 9h. 15m. of longitude; their tides differ in time 9h. 47m.

say when the idea of deriving tides from this southern ocean arose. Lieut. J. Cook, reporting tidal observations for the south Pacific, asserted, in 1772,* "I am fully convinced that the flood comes from the southward, or rather from the southeast." Laplace seems to have entertained a similar idea for the Atlantic, and assigned a day and a half as the time it took a wave to come from the "main ocean."

The earliest attempt to draw cotidal lines was in 1807, by Dr Thomas Young.† It is a sketch of the British islands, with coasts

FIGURE 1

of France and Norway and progressive tidal lines. The lines were drawn straight, crossing the English channel nearly at right angles to its axis, and in other places springing squarely off from the shores. In a supplement to the Encyclopædia Britannica, written in 1823, Dr Young suggested the tracing of cotidal lines, indicated sources of data, declared the scheme impracticable, *but collected and reduced the data for 150 stations*, and described

* Phil. Trans., 1772, p. 357.

† Lectures on Natural Philosophy, vol. i, pl. xxxviii.

the general course of a tidal wave advancing up the Atlantic at least as far as Gibraltar.

Dr William Whewell took up the investigation in the thirties. From all the charts, sailing directions, and ocean pilots he could obtain, he computed cotidal hours for points all over the world, being the time of high water on the day of new or full moon. From these data he traced the progression of the tide up the Atlantic to the coasts of Europe and America, deriving it from the belt of ocean to the south. He published his cotidal chart in 1833.* He was fully conscious of the very crude data given him at times by observers who fancied the tides always occurred at the same hour, and he closed his first essay with the warning that the results were only tentative. Figure 1 reproduces the Atlantic portion of this chart.

Dr Whewell was moved by this lack of good data to seek the coöperation of the admiralty to have careful observations made simultaneously at least about the British shores. He not only accomplished this, but was enabled in 1835† to publish observations made according to his instructions at 666 stations in America and Europe, with two at the Cape of Good Hope, for every tide between the 8th and 28th of June of that year. The greater part of these were about the British isles, and for this region he published a revision of his chart. For the American coast he contented himself with pointing out some errors in his first chart. The rest of the chart he abandoned until a wide range of good observations should be at hand.

DIFFICULTIES OF THE EARLIER VIEW

Now defects in the general scheme of cotidals are defects in the theory of a wave progressing up the Atlantic from the south. These defects Whewell found to be based on (1) the extraordinary manner in which the cotidals contour about the lands, together with the difficulty of including the oceanic islands in the system, and (2) the great difference of epoch of the diurnal wave in Europe and America, together with the identical epoch in Spain and at the Cape of Good Hope, supposed to be separated by a long journey up the Atlantic.

* Phil. Trans., 1833, p. 147. This chart is reproduced in numberless excellent works, though abandoned by its author in the first two years of its existence, and it is usually reproduced, even in America, without the correction the author indicated for the xiih. line on our coast. Thus in Young's General Astronomy, for instance, 1889, p. 287.

† Phil. Trans., 1836, p. 289.

A comparison of Whewell's two maps of British cotidals, figures 3–4, with Dr Young's 1807 sketch, figure 2, shows the growing appreciation of the contouring tendencies of cotidals. With the abundance of fairly good data at hand today, it is everywhere observed that cotidal lines adjust themselves closely to the shore line. With reasonable depth, it is quite usual for high water to appear far up a bay as early as at its mouth. High water reaches the head of Placentia bay, Newfoundland, about a half hour *before* it reaches the headlands on either side of the mouth, as may be seen on the accompanying sketch, figure 5, where three stations are shown, at the bay head and at either side of the entrance. The upper figures at each place indicate the interval between high water at St Johns and local high water. The lower figure indicates the tidal range in feet. From the line of 100 fathoms it is

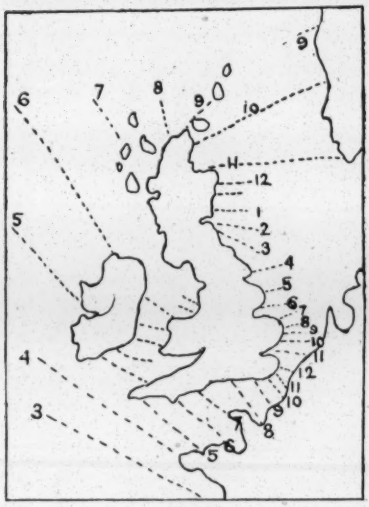


FIGURE 2

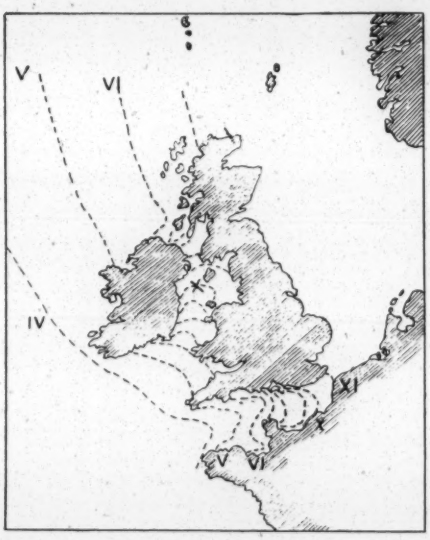


FIGURE 3

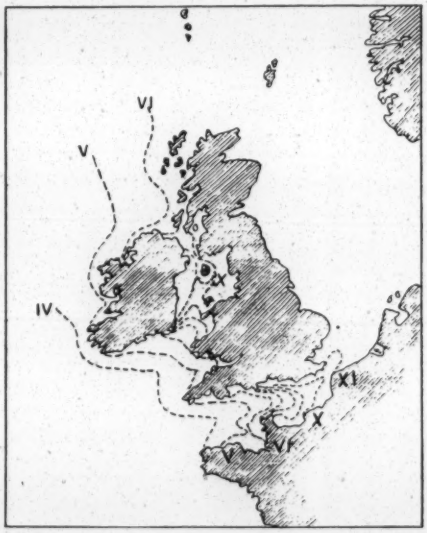


FIGURE 4

evident that the impulse is transmitted to the various stations with a delay dependent on distance from the deeper water, yet there is no tide of the progressive estuarine type. This failure is complete in the three characteristics of time, range, and front steepening, since the interval from high water to low water is 6h. 13m. at all three stations, implying equal front and back slopes in the tide wave.

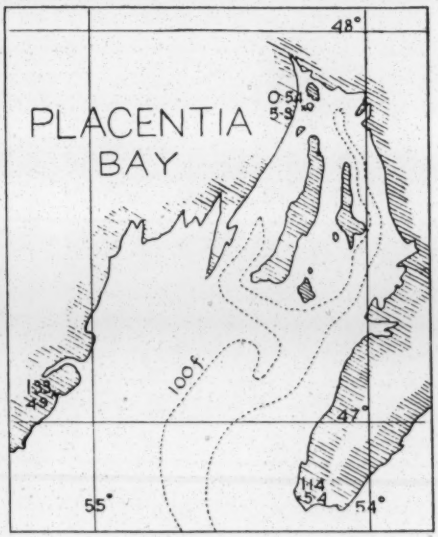


FIGURE 5

Buzzards bay has tides that reach almost all its shores at the same time, as if originating at some point central to the bay. Dr Bache, in 1864, noted the essential feature that its tides are nearly synchronous at the head and all about the bay. To illustrate this, figure 6, besides showing the tidal interval for each station from No Mans Land, shows also the 30m. cotidal. There is certainly no progression up the bay here, nor is there any perceptible increase in tide ranges.

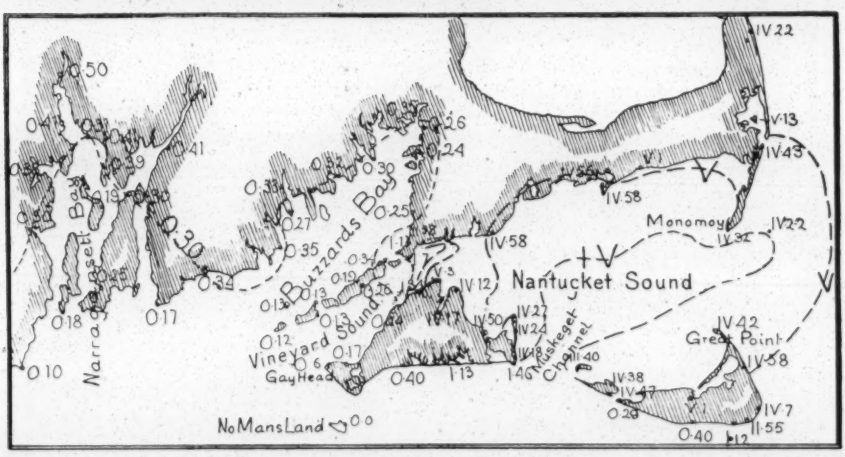


FIGURE 6

The duration of rise is greater than that of fall, and grows still more so up the bay.

Westport, bay mouth: rise 6h. 31m., fall 5h. 54m.

Wareham R., bay head: rise 6h. 55m., fall 5h. 30m.

This is anomalous, yet it is to be remembered that there is no progression between these points—the tide reaches them about the same time.

Narragansett bay is an undoubted drowned river, or rather two of them. The several channels complicate the topography. The ranges mount up from 3.1 feet and 3.6 feet at the entrance to 4.9 feet at Nayat point. Thence it diminishes to 4.4 feet at Providence. Even here the close adjustment of cotidals to shore contours appears in the fact of nearly simultaneous high water at Sakonnet, Prudence light, and Point Judith. The lingering rise of the tide noted in Buzzards bay appears here also.

Bay mouth: rise 6h. 25m., fall 6h.

Bay head: rise 7h. 5m., fall 5h. 10m.

The bay-head observation is at Providence, where there is some tidal progression. In this case, then, the wave has become less steep-fronted as it advances.

In Vineyard sound again the cotidals are seen to be contouring ones and strongly contouring. It is difficult to comprehend how this can be a local development of a long wave front progressing across the Atlantic. Only from Gay Head to Woods Holl are there clear signs of progression.

In the Bay of Fundy high water reaches points near the head of the main bay a few minutes *before* reaching the Maine coast, just outside the bay entrance. Long Island sound gives another surprising illustration of the same tendency. This conception of a *contouring* wave front seems to introduce an element of confusion. There is something very reasonable, simple, and satisfactory in the earlier idea of a long wave-crest, straight or only gently curving on a long radius; yet even in the shallow waters that rear up considerable waves this view is seen to be untenable. Thus the tide reaches Sandy Hook 30 to 45 minutes earlier than points farther out to east and south; so also in St Peters bay, Cape Breton island. As already stated, this contouring tendency of the cotidals became evident to Dr Whewell as soon as he had good data to work on. He saw that on the Atlantic coast of North America, too, the lines must be bent along shore, though he did not draw them.

Airy, in the Encyclopædia Metropolitana, suggests that the

cotidal line is to be regarded as the crest-line of a great wave, sweeping from shore to shore, as it might be seen by an eye far above the earth. The characteristic feature of such a wave is that every point of the ocean is regarded as first rising, then falling. Such was probably Whewell's conception, and it is widespread today; yet with the abundant data of today it is not possible to comprehend how a progressing wave should adapt itself so completely to the shores as is found to be the case. An advancing wave would doubtless tend to adjust itself to the shores of an estuary, but the adjustment observed is more than a tendency.

Opposed to this conception is that of a stationary wave, conceived to have a medial point without vertical motion, called a node. Contemporaneous with a rise of water on one side of this node occurs a fall on the other. For the ocean there is no progression of high water; the whole water body swashes alternately east and west. For an ocean to oscillate about a node in adjustment to the moon's apparent motion is only possible with a given relation between depth and width. By counting the oscillations in 5 or 10 seconds with various depths of water in a bowl or tumbler, the reader may satisfy himself that for each combination of width and depth there is a constant period of oscillation. If the North Atlantic has such an oscillation in a period of a lunar half day, it must have the width and depth that correspond.

GROWTH OF THE LATER VIEW

The first suggestion of such an oscillation was by Young:* "We may therefore consider the Atlantic as a detached sea about 3,500 miles long and 3 miles deep." The depth he assumes from theoretical considerations. He considers that the wave from the southern ocean might meet the local oscillation about Gibraltar, when it would doubtless superpose itself upon it. The moon's relation to the motion of the detached ocean is thus suggested by Dr Young:† "The oscillations of the sea, . . . constituting the tides, are subject to laws exactly similar to those of pendulums capable of performing similar vibrations in the same time and suspended from points which are subjected to . . . regular vibrations, of which the . . . periods are completed

* Natural Philosophy, vol. 1, p. 581.
† Nicholson's Journal, 1813, August, p. 217.

in half a lunar . . . day." Just as the hand that supports a pendulum may maintain its motion by a gentle lateral movement, so the moon's attraction may apply a periodic impulse to a body of water deep and wide enough to oscillate in half a lunar day, and thus make its oscillations perpetual.

Admiral Fitzroy,* in 1863, republished some suggestions of his own of earlier date, that the North Atlantic tides (among others) seemed better accounted for as an "oscillation, as of water in a basin; or a libration, as a mass of jelly," than as a progression of a southern tide wave. His argument points to irregularities in any system of cotidals, the absence of significant tide in the Plata estuary, opening fairly to the supposed ocean tide, and the relation between times of high water on opposite shores. In the North Atlantic he found high water on the American shore fairly synchronous with low water in Europe. In 1879 Mr Henry Mitchell† pointed out that high tide is fairly synchronous from Newfoundland to Hatteras, omitting the Gulf of Maine. Moreover, along this outer coast flood tide current sets to southwest and ebb to northeast. These two facts and the phenomena of the Gulf of Maine are more intelligible on the hypothesis of an oscillating North Atlantic than on any other. The current would result from the northeast-southwest trend of the coast, confining an ocean oscillating east and west, a portion of the westward motion being resolved parallel to the coast.

THE STATIONARY WAVE IN THE NORTH ATLANTIC

It has been noted above that Dr Whewell's data of 1836 showed him that the American cotidals were imperfect. Though he did not redraw the line, he stated that the xii-hour cotidal should be nearer the coast, and Dr Bache‡ drew it closely contouring from Nantucket to Hatteras and south. It is well established now that, omitting the Gulf of Maine and other enclosed areas, the tides are fairly synchronous from New Foundland to Florida. The great Atlantic oscillation belongs to the deep basin. Across the continental shelf, both east and west, the disturbance is transmitted as a progressive wave, and of course delayed in transmission. As a rough outline of the Atlantic basin, I have dotted in figure 1 the portions less than 2,000 fathoms deep, not that

* Weather Book, Appendix on Tides.
† Ann. Report U. S. Coast and Geodetic Survey, p. 175.
‡ Ann. Report U. S. Coast and Geodetic Survey, 1857.

the continental shelf attains anything like that depth, but the descent from the shelf on east and west falls rapidly to that figure. The ocean basin is thus slightly larger than the parts left white on this sketch.

The Atlantic basin is seen to approach much nearer the Spanish and African coasts than the American or the English and Scandinavian. Sable island, east of Nova Scotia, lies close to the margin of the continental shelf and has its high water 6h. 28m. after high water on the west coast of Spain and about two hours before the actual American coast farther west, just as the Spanish coast has its tides earlier than the British isles and northern Europe generally, where a true progressive wave exists and travels across the shallow waters. This oceanic basin is so shaped and proportioned as to possess an oscillation period of half a lunar day, and twice a day the moon's attraction inclines its surface now east, now west. The figures for Sable island and Spain show that low water on the east coincides with high water on the west. As the ocean basin is not bounded by straight lines, every tongue of deep water that advances among shallows toward the land transmits the tidal impulse synchronously with the swaying of the Atlantic. In the shallows progressive waves carry the impulse further. Whole bays respond to the oceanic movement, and only in exceptional areas can cotidals be truly drawn. The Irish channel in Whewell's second chart and the Gulf of St Lawrence well illustrate the limitations of the cotidal. The great coastwise ebb and flow of the Atlantic currents govern the long lines of bars and sand islands of the eastern United States.

It is noteworthy that the so-called Atlantic ridge, really a broad, gentle swell, must occupy about the same position as the node of the ocean oscillation. One is tempted to speculation on possible accumulations of finest ocean silts in this stiller axis of the swaying mass through the long ages of geologic time. One may wonder again if the moon's periodic impulse does not forbid a departure of the ocean basin from the form demanded for an oscillation in harmony with lunar time—in other words, whether the moon may not have contributed to the permanence of oceanic basins in governing oceanic tides. The tide must resist any attempt to change its period.

THE PEAK OF ITAMBE

In a private letter, dated September 16, 1898, Lieut. James A. Shipton, U. S. A., Military Attaché to the U. S. Legation in Brazil, writes as follows:

I have just returned from a trip to Diamantina, in the state of Minas Geraes. While there I climbed the peak of Itambé, in company with Mr Beaumont, the secretary of the English Legation, and a Mr Coleman, the latter, however, not reaching the summit. We are supposed to have been the first men ever on the summit of this peak. From where we camped the last day it was about four hours' work, in spite of the assurance of our four Brazilian guides that we should require four days more. There were only two places of difficulty, but it was hard to convince the inhabitants that we had been on top. We started a fire in the grass on a small plateau near the highest rocks and on the highest point left a part of our bottle of wine, carried by the only one of the guides who accompanied us to the summit. The people of the neighborhood believed that there was a lake on top and a beautiful lady, of course. There are many onças (tigers) and antes (tapirs), their paths being plainly visible in the long grass. Our Brazilian guides kept up a fire to keep the onças from our mules while we slept. From Diamantina we were gone four days and rode 75 miles. Nine rivers have their sources on this peak, and one does not wonder when one sees the number of springs and marshy places on the mountain. Only twice we had to cut a road through the brush and one night our supper consisted of a parrot stew.

GEOGRAPHICAL ASPECTS OF THE MONROE DOCTRINE

That our German friends view American aggressions with suspicious eye, and detect the Monroe doctrine lurking in unexpected places, is evidenced by the following extract from *Petermann's Mittheilungen*, 44 vol., 1898 (p. 47, America):

"The U. S. Board on Geographic Names, which has done good work in fixing the names of localities, mountains, and rivers within the United States, and has thereby eliminated many erroneous designations, cannot avoid overstepping from time to time their prescribed limits and extending their activity to regions not within their jurisdiction.

"Occasioned by the discovery of the gold fields on the Klondike, it has subjected the usual and often varying names in the Yukon district to severe criticism. Many real errors have thereby been corrected, and the

discoverers, as well as those who were honored by them in the matter of naming localities, have been given their just dues.

"The name of the river has been confirmed Klondike; instead of the names Labarge and Lindemann or Linderman for the lakes of the Upper Yukon, Lebarge and Lindeman are given; Taiya instead of Dyea (a town on the Chilcoot inlet), etc. (*Science*, Oct. 15, 1897.)

"Even admitting the correctness of these changes, exception must be taken to such action in regions which do not belong to the United States. The greater part of these names belong to Canadian territory, where American officials, in spite of the Monroe doctrine, have nothing to say, and where undoubtedly the Canadians have the exclusive right to give the names."

GEOGRAPHIC LITERATURE

The Louisiana Purchase and Our Title West of the Rocky Mountains, with a Review of Annexation by the United States. By Binger Hermann, Commissioner of the General Land Office. Washington, 1898. Small quarto. Pp. 1–87, with several maps and portraits.

In this work, just issued from the Government Printing Office, the United States General Land Office takes a new departure and falls into line with those federal bureaus which aim to advance knowledge in connection with their administrative work. Hitherto the more important publications of the General Land Office have been limited to maps—maps of the land-survey states on separate sheets and a general map of the United States on a scale of about forty miles to the inch. Some months since a new edition of this general map was issued showing, in addition to the general and special cartographic features with which the Land Office is directly concerned, the political structure of the United States—*i. e.*, the original territory together with the several territorial acquisitions. On this map the "Louisiana purchase" and "Oregon Territory" were combined as a single acquisition. Now comes Commissioner Hermann with a correction of this error, supported by original documents and maps, and with a full recital of the historical events connected with the purchase of Louisiana territory from France and with the discovery and settlement of Oregon. Incidentally he addresses himself to current issues, at least between the lines, by taking up the general discussion of territorial acquisition in the history of the United States and showing the consequent benefits to the nation. Referring to the cost of the enormous territorial acquisitions, quadrupling the original area of the country, he says: "The grand total of the sums paid for our foreign acquisitions amounts to $52,200,000, a sum less than the value of one year's output of Montana's minerals, of Minnesota's annual wheat-yield, or of the cattle and hay product of California for one year" (page 70); then he proceeds to analyze the early objections to annexation, to inquire into the constitutionality of annexation, to forecast our future destiny, and to extol the wisdom displayed by our statesmen in the acquisition of

the Sandwich islands, leaving for his last word a forcible plea for the construction of the Nicaragua canal. The book is timely, valuable, and an occasion for congratulating the Land Office on this new display of interest in public affairs.

W J M.

The State: Elements of Historical and Practical Politics. By Woodrow Wilson, Ph. D., LL. D., Professor of Jurisprudence and Politics in Princeton University. Revised edition. Boston, D. C. Heath & Co., 1898. 8°. Pp. xxxv, 656.

This work, issued in 1889, several times reprinted, now revised, presents an outline of government from primitive forms to typical states—ancient Grecian states and Rome, present France, Germany, Switzerland, Austria-Hungary, Sweden, Norway, Great Britain, and the United States. By rearrangement, Hellas, a region, precedes Sparta and Athens. Changes in the text upon Rome, France, Germany, or Great Britain involve more space than those relating to the United States, to which immediate interest and limited space mainly restrict these notes. The work includes three topics, regarding which confusion often exists in text-books of geography, history, and government: I. Cession of territory; II. Towns or township; III. Cities.

I. The difference between cession of jurisdiction and giving title in fee is clearly recognized in this work, but absolute accuracy is not maintained in particulars.

After stating (sec. 1266) that Maryland and Virginia granted territorial jurisdiction for a seat of national government, and that the government buys sites for arsenals, dock yards, forts, and light-houses, receiving from states exclusive jurisdiction, to lapse when the public use of the property ceases (sec. 1269), the author says (sec. 1272): "The post-offices, federal court chambers, custom-houses, and other like buildings erected and owned by the general government in various parts of the country are held by the government upon the ordinary principles of ownership, just as they might be held by a private corporation. Their sites are not separate federal territory."

The Constitution of the United States says: "The Congress shall have power . . . to exercise exclusive legislation in all cases whatsoever over such district as may . . . become the seat of the Government . . . and to exercise like authority over all places purchased by the consent of the state in which the same shall be for the erection of forts, magazines, arsenals, dock yards, and other needful buildings." (Art. I, sec. 8, clause 17.)

The United States statutes prescribe that "no money shall be expended upon any site or land purchased by the United States for . . . any . . . public building, of any kind whatever, until the written opinion of the Attorney General shall be had in favor of the validity of the title, nor until the consent of the legislature of the state in which the land or site may be to such purchase has been given." (U. S. Rev. Stat., 1878, sec. 355.)

The laws of Massachusetts provide that the United States, with the

acquirement of a title in fee, shall "have jurisdiction over any tracts of land within the commonwealth which may be necessary for the erection of marine hospitals, customs offices, post-offices, life-saving stations, . . . but the commonwealth shall retain concurrent jurisdiction . . . so far that all civil and criminal processes issuing under authority of the commonwealth may be executed thereon . . ." (Pub. Stat. Mass., 1882, chap. 1, secs. 3, 4.)

"The following property . . . shall be exempted from taxation: First. The property of the United States." (Idem, chap. 11, sec. 5.)

Such acts vary in detail, but even, uniform exemption from taxation distinguishes the federal title from the title of a private corporation.

II. There are in the United States: 1. Towns: (*a*) bodies corporate of a grade below cities; (*b*) rural bodies with democratic control of certain local affairs, sometimes including schools. 2. Townships: (*a*) the towns last defined, under another name; (*b*) bodies for school administration only; (*c*) congressional townships, simply areas, of 36 square miles, laid out by government surveyors, often the bases for school townships.

Two forms of local government are technically: County government, township organization. Usually one form prevails throughout a state. Illinois and Missouri, however, originally under county government, authorized counties desiring it to adopt township organization, and both forms are found in each of these states, at least. Each was laid off in congressional townships, in which the sixteenth or school sections were for the township. The school township prevails throughout both states, and yet not of course. In Louisiana, with a like survey and a like land grant, there is no corporate township. That state, recognizing a township only as a peopled area with a title to the school section, has acted as trustee and keeps accounts with congressional townships in distributing revenue from the land to schools therein.

The grant was not uniformly "to a township" (sec. 1255), but in a township, sometimes to the state, as in Florida and in Kansas, where a corporate school township has not grown from the congressional township.

A congressional township, a school township or town, and a civil town or township may occupy the same area at the same time, and a city corporation may be coincident upon more or less of the same area. The greatest variety of civil bodies corporate can probably be found in Illinois or Missouri especially, with the early charters still valid. The student of "The State" will have occasion to supplement its explanations, as, indeed, the author suggests.

III. This edition is apparently the first text-book to recognize the independence of residents in certain cities from county taxes and county control.* The student may advantageously look for kindred cases. In arranging the functions of Boston and Suffolk county, some of which are interchangeable, it is provided that "Chelsea, Revere, and Winthrop shall not be taxed for county purposes" (Pub. Stat. Mass., 1882, chap. 11, sec. 47). In Kentucky, in counties containing cities maintaining separate

* The conditions in Baltimore, St Louis, and the cities of Virginia were published in the NATIONAL GEOGRAPHIC MAGAZINE, March, 1896.

schools, a county superintendent and the voters who elect him must reside in that part of the county outside the cities.

"There is no complete and general municipal incorporations act in any of our states; . . . the largest towns are left to depend for their incorporation upon special acts of legislation" (The State, sec. 1245). One constitution at least (Illinois, 1870, art. iv, sec. 22) prohibits local or special laws for incorporating cities, towns, or villages, or changing or amending their charters, and communities of any size can act under laws harmonious with it.

The discussion of national citizenship and state citizenship does not seem wholly consistent. Some day an "inhabitant" who has legally voted in one state for a representative in Congress and has been denied the right so to vote in a state to which he has removed may secure a decision from the Supreme Court that will warrant positive assertions. Till then the author may well say: "A very considerable amount of obscurity, it must be admitted, surrounds the question of citizenship. . . . It has become extremely difficult to draw any clear line between citizens and aliens" (sec. 1121).

While the diversity of our marriage and divorce laws is demoralizing, it is not quite clear how "it may be possible for a man to have different wives or a woman different husbands in several states at one time" (sec. 1110), except as a criminal.

The superintendent of public documents is now under the Public Printer, not under the Secretary of the Interior (sec. 1348).

This edition is neater than the first, the paragraphing is better, the reference lists are made alphabetical (pp. 160, 161 excepted). The book has no rival for its particular place in the class or in the library.

JAMES H. BLODGETT.

MISCELLANEA

During 1897 the gross reduction in the effective mercantile marine of the world, through wrecks and condemnations, amounted to 1,045 vessels, aggregating 726,800 tons. From this number vessels of less than 100 tons were excluded. Of the above total 293 vessels of 398,207 tons were steamers and 752 of 328,593 tons were sailing-vessels. The United Kingdom shows the smallest percentage of loss, viz., 2.7 per cent of the vessels owned, and Norway has the highest, with 7 per cent.

The Florida Coast Line canal, after nine years' work, is now completed from Mosquito inlet to Miami. Boats drawing five feet pass semi-weekly the entire distance from Titusville on the Indian river through Lake Worth to Palm beach. Three short cuts complete the canal—two between Matanzas and Tomoka and one uniting North river with Pablo creek. Eventually the canal will connect the St John river with Biscayne bay, and render an inland passage possible along the Atlantic coast from Long Island sound to Key West.

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